Conclusion

Our experience, although diminutive, has confirmed the published opinions that radioactive phosphorus offers the most convenient means of controlling the haemopoietic exuberance of polycythaemia rubra vera. In 80% of patients the blood count is restored to normal for at least a year, and the symptoms immediately attributable to its previous perversion are relieved; the remainder are either resistant to this form of treatment or show leucopenia or thrombocytopenia sufficient to make it dangerous.

Acute myeloblastic leukaemia is a more common termination in those given P^{32} than in those not so treated. The size of this risk remains to be assessed, and it will be some years before we can be certain that the mean survival is increased or the incidence of vascular and other complications lessened by treatment with radioactive phosphorus.

REFERENCES

- Bell, E. C., and Davis, P. L. (1950). *Amer. J. clin. Path.*, **20**, 839.
 Erf, L. A. (1946). *Blood*, **1**, 202.
 Lawrence, J. H. (1949). *J. Amer. med. Ass.*, **141**, 13.
 Reinhard, E. H., Moore, C. V., Bierbaum, O. S., and Moore, S. (1946). *J. Lab. clin. Med.*, **31**, 107.
 Richardson, W., and Robbins, L. L. (1948). *New. Engl. J. Med.*, **238**, 78.
 Rosenthal, N., and Bassen, F. A. (1938). *Arch. intern. Med.*, **62**, 903.
 Scott, K. G., and Lawrence, J. H. (1941). *Proc. Soc. exp. Biol., N.Y.*, **48**, 155.
 Spurr, C. L., Smith, T. R., Block, M., and Jacobson, L. O. (1950). *J. Lab. clin. Med.*, **35**, 252.
 Stroebel, C. F., Hall, B. E., and Pease, G. L. (1951). *J. Amer. med. Ass.*, **146**, 1301.
 Videback, A. (1950). *Acta med. scand.*, **138**, 179.
 Wiseman, B. K., Rohn, R. J., Bouroncle, B. A., and Myers, W. G. (1951). *Ann. intern. Med.*, **34**, 311.

OBSERVATIONS ON PROGNOSIS IN HYPERTENSION

BY

A. W. D. LEISHMAN, D.M., F.R.C.P.
 Consultant Physician, United Sheffield Hospitals

Lumbo-dorsal sympathectomy for hypertension is no longer a novelty, although in this country experience of this method of treatment is perhaps only now maturing. Reports of success from this operation have been criticized by Platt and Stanbury (1950) on the grounds that the prospects of many of the patients chosen for operation may well have been favourable in any case. Such criticism, indeed, cannot easily be refuted, since it exposes an unfortunate gap in our knowledge.

Follow-up studies such as those of Janeway (1913), Blackford, Bowers, and Baker (1930), and Bechgaard (1946) have helped to give us a fair conception of the overall prognosis in hypertensive disease, yet probably most of us would agree that, though we could recognize the malignant type of case and perhaps the obviously benign case, we are seldom in a position to predict with any confidence the future of a hypertensive patient, at least at the first examination. So long as we lack this facility unnecessary operations may be inflicted upon hypertensive patients, while in others the decision to operate may well be left too late. It seemed that this situation could be remedied only by acquiring a wider experience of short-term prognosis in hypertension, and this was the object of the present study.

The observations were begun in 1946 at a clinic for hypertensive patients. In addition to the selection of cases for sympathectomy it was proposed to follow the progress of every patient by full examination at regular

intervals; the hope being that when eventually each individual course or fate came to be related to the original clinical findings these would establish the guiding principles by which even at the first examination a hypertensive patient's future might be predicted.

Patients were not accepted for this study unless their diastolic pressure was 100 mm. Hg. or above (the systolic pressure has been largely ignored), or if their age exceeded 60; later, with interest becoming centred on the younger group, the age limit was lowered to 50. The period of observation ranged between two-and-a-half and five years and the patients were examined at intervals of twelve months, six months, and in a few cases three months; according to the severity of their disease. The clinical examination and investigation were strictly standardized, and a progress sheet incorporating the main features in graph form was maintained for each patient.

Since blood pressures were often found to differ considerably in the two arms, the average of a number of readings in both arms was recorded, the final figures being taken after 20 minutes' undisturbed rest. The blood pressure was also taken with the patient standing, and in the leg as well at the first examination, lest coarctation of the aorta be missed. Retinal changes were classified in the conventional five grades as initiated by Wagener and Keith (1939): grade 0, normal; grade I, spastic retinal arteries with or without variations in calibre; grade II, compression of veins at arteriovenous crossings; grade III, the presence of exudate or haemorrhages; and grade IV, papilloedema. The investigations included intravenous pyelography; 6 ft. (1.8 m.) chest x-ray film for record of heart size in terms of cardio-thoracic ratio; 12-lead electrocardiography; chemical, microscopical, and culture examination of urine; urea-clearance test; modified urine-concentration test; and standard blood biochemistry.

The review is based on the study of 151 hypertensive patients (93 women, 58 men) who fulfilled the necessary criteria. These were first examined during the period October, 1946, to June, 1949; they were treated conservatively, and their fate or condition was known at the end of 1951.

Mortality

During the period of observation 51 patients (34%) died as a consequence of hypertension. The death rate for men alone was 44%: the male mortality was higher in each of the main causes of death, with the exception of cerebral vascular accidents, in which proportionately the sexes were equally represented. Even this slight difference may not be fortuitous, since Frant and Groen (1950) showed an actual preponderance of women dying from strokes.

The age at which the 51 patients died and the individual causes of death are shown in Fig. 1. As would be expected, most of the deaths occurring before the age of 45 were due to uraemia, whilst most deaths from other causes occurred in the sixth decade. The height of the diastolic pressure has obviously an important bearing upon mortality, particularly in the case of hypertensive men (see Table).

Percentage Mortality in Relation to Diastolic Blood Pressure at First Examination

	Diastolic Pressure					
	100-119 mm. Hg		120-129 mm. Hg		130+ mm. Hg	
	No.	Deaths	No.	Deaths	No.	Deaths
Men	18	1 (5.5%)	16	7 (43.8%)	24	19 (79.2%)
Women	39	4 (10.3%)	17	5 (29.4%)	37	15 (40.5%)

FIG. 1.—Age at death of 51 patients dying from hypertension. Cause of death: U=uraemia; H=cerebral haemorrhage; C.T.=coronary thrombosis; C.F.=congestive heart failure; D.A.=dissecting aneurysm.

For example, at the end of this comparatively short period of observation, only 5 men were alive out of 24 who had a diastolic pressure of 130 mm. Hg at their first examination.

Analysis of Clinical Findings

There were 100 survivors, and in Fig. 2 these have been divided into two groups according to the diastolic pressure at their first examination; in 73 it was below 130 mm. Hg and in 27 it was 130 mm. Hg or over. This chart shows the percentage incidence of certain of the main clinical features when these patients were first examined. While percentages of relatively small groups are obviously open

FIG. 2.—Data at first examination of 100 survivors.

to criticism, as a method of comparison they seem unavoidable. Since the object of this form of presentation is essentially to show trends, it was thought that on this basis they could be accepted.

It will be seen that in the severe group more hearts are enlarged, more electrocardiograms are abnormal, more retinæ show advanced changes, and there is a greater incidence of angina. On the other hand, albuminuria is no more frequent and headache occurred equally in the two groups.

Searching next for some indication of why one patient is more liable to a cerebral vascular accident than another, the presenting clinical features of 30 patients who later had strokes of one sort or another are compared with those of a group of 17 severely hypertensive patients who survived without such disasters (Fig. 3). By selecting severe cases

for comparison it was considered that any differences found would have increased significance. Despite the fact that in the former group blood pressures were not uniformly severe, there seems little doubt that these patients for the most part had the more advanced disease: not only were there more enlarged hearts and abnormal electrocardiograms among the patients who developed cerebral vascular accidents, but the incidence of retinal changes of grades III and IV and of true albuminuria was also notably higher.

A similar clinical analysis of the patients destined later to die from uraemia is presented in Fig. 4. It will be seen that little more than half of these patients had diastolic pressures in the severe range when first examined, and that enlarged hearts and abnormal electrocardiograms were the exception. Hypertensive headache was almost universal, but the outstanding feature of this group is the remarkable frequency of advanced retinal changes and of true albuminuria. No less than 90% of the cases had retinal changes graded as III or IV, and 75% had albuminuria in excess of a trace.

If now Figs. 2, 3, and 4 are considered together some interesting trends can be recognized. For example, the incidence of severe retinal changes (grades III and IV)

FIG. 3.—Comparison, at first examination, of 17 patients with severe hypertension who have had no cerebral vascular accident with 30 patients (13 survivors) who have had cerebral vascular accidents.

and of true albuminuria when related to the four groups of patients (Fig. 5) shows a remarkably progressive pattern. The parallel behaviour of these distinct features with its suggestion of a single pathological process should also be noted.

Enlarged hearts and abnormal electrocardiograms show a similarly progressive incidence in three of the groups of patients. These changes, however, were not a feature of the fourth group who died from uraemia; this is not surprising, for many were young and their disease was probably of relatively short duration. While from these figures it may be inferred that a high diastolic pressure increases the chances of developing an enlarged heart or an abnormal

FIG. 4.—Clinical analysis of 20 patients subsequently dying from uraemia.

electrocardiogram, other factors are clearly involved, for it will be seen that these changes were encountered most often of all in a group (30 patients who developed cerebral vascular accidents) in which severe blood pressures were not consistently found.

Thus far, at least one conclusion seems inescapable: that regardless of the height of the blood pressure the stage which the hypertensive disease has reached may best be judged on the presence or absence of these four clinical

features — namely, advanced retinal changes, albuminuria in excess of a trace, cardiac enlargement, and abnormality of the electrocardiogram.

Secondary Hypertension

A primary cause was possibly responsible for the hypertension in 21% of the 151 cases in this study (and 25 others submitted to sympathectomy). In all but three cases the primary cause was renal; the exceptions being res-

FIG. 5.—Incidence of advanced retinal changes and of albuminuria in four groups of hypertensive patients.

spectively cases of pheochromocytoma, Cushing's syndrome, and periarteritis nodosa. A primary cause was recognized in 32% of the fatal cases, but, rather surprisingly, of the 20 patients dying from uraemia only 7 at most were thought to have primary renal disease.

Familial Incidence

Inevitably any estimate of the familial incidence of vascular renal disease which relies upon information supplied by the patients themselves is likely to be inaccurate. But, making every allowance for this, the figure of 35% obtained in this group seems surprisingly low. A familial tendency, however, has not appeared to influence prognosis, for among the fatal cases the incidence was no higher, and it was perhaps rather surprising though comforting to find that, so far as the 15 deaths from strokes were concerned, history had repeated itself in only three instances.

Obesity and Prognosis

Obesity and hypertension have proved a favourable combination, for 50% of the 100 survivors were overweight, compared with 14% of the patients who later succumbed. Yet apparent objective improvement may follow substantial weight reduction. It was found, for example, that 11 patients out of 18 showed an average fall in diastolic pressure of 17 mm. Hg after reducing their weight by 21 to 56 lb. (9.5 to 25.4 kg.); in seven cases the heart appeared to decrease in size as well. Though at first sight a paradox, the probable explanation is as Wood (1950) suggests, that obese patients are not as severely hypertensive as they appear; certainly the benign course pursued by these patients despite high diastolic pressures would support this view. The exaggerated sphygmomanometer reading obtained in a fat arm seems likely also to account for the apparent fall in blood pressure after weight loss; and even reduction in size of the

cardiac silhouette does not necessarily indicate objective improvement, since loss of abdominal fat with lowering of the diaphragm will of course alter the position and contour of the heart.

Progress of Surviving Patients

At the end of the observation period three-quarters of the 100 survivors were still leading unrestricted lives, but in at least 60% there was evidence that the disease had advanced. This was shown mainly by enlargement of the heart, deterioration of the electrocardiogram, or advance in retinal grading; blood pressures showed little tendency to rise. Albuminuria to the extent of a trace or light cloud made its appearance in the urine of more than half of the cases with severe hypertension, and here also there was a tendency for the specific gravity of the urine to become fixed. Broadly speaking, however, the severe cases behaved little differently from the milder ones, with the exception that cerebral vascular accidents occurred six times more often among the former.

Discussion

Hypertensive disease must be regarded as inevitably progressive, but the rate of progress, and therefore the prospects, of each patient are infinitely varied. Prognosis is essentially concerned with estimating the rate of advance. A full study of each hypertensive patient along the lines adopted in this investigation will reveal the extent of the damage already caused by the hypertension, and if this is then related to the patient's sex, age, and build, and above all to the height of his diastolic blood pressure, it should generally be possible, even when first seen, to assign a case to one of two categories: benign hypertension or "accelerated" hypertension.

Benign or Slowly Progressive Hypertensive Disease

The patients in this group, fortunately the largest in the hypertensive community, are likely for the most part to survive at least to 65. The most common cause of death is from congestive failure (Goldring and Chasis, 1944); uraemia is extremely rare except as a complication of heart failure, and cerebral vascular accidents are not to be expected until a reasonably advanced age. It is true that on occasion a patient who initially appears to qualify for this group will unexpectedly develop signs of an accelerated process, though this seems to be uncommon: within the period of this study not more than two patients from the 100 survivors appeared to alter course in this manner.

Recognition of this form of hypertensive disease presents little difficulty, for most of the patients are women with

diastolic blood pressures consistently nearer 100 mm. Hg than 120 mm. Hg; but, since many of them are obese, some allowance for this must be made when higher pressures than these are recorded. Retinal changes observed in these cases never exceed grade II. The urine rarely contains more than a trace of albumin, and loss of concentrating power is the only indication of impaired renal function. The heart enlarges progressively, but the electrocardiogram as a rule becomes abnormal only when the enlargement is considerable (Leishman, 1951).

"Accelerated" Hypertensive Disease

At the opposite end of the scale the most rapid form of the disease, which usually terminates in uraemia below the age of 45, is also easy to identify. Unfortunately, however, such cases are often encountered only in the pre-terminal phase, when symptoms such as failure of vision compel attention for the first time. The age, the advanced character of the retinal changes—that is, grade III or IV—and the presence of a dense cloud of albumin distinguish this type of hypertensive case from all others. Most of these patients are men, and they are rarely, if ever, obese. Diastolic blood pressures tend to be high, of the order of 130 to 150 mm. Hg, though this is not invariable. At the first examination renal function may have failed to the point that urea retention is already established, but so rapid is the disease process that the heart, on the other hand, may have enlarged little and may still be maintaining good function. It seems a rather profitless endeavour to attempt to decide whether a case of this character is primarily due to renal disease or not. Indeed, the only practical question is whether or not the disease is too advanced for sympathectomy.

Malignant hypertension is still regarded in some quarters as a disease of its own unrelated to other forms of hypertensive disease. In the light of clinical experience, however, this seems improbable, for there is no sudden transition between the clinical picture conventionally described as "malignant" hypertension and that of other cases of longer survival which run an abnormal and unfavourable course. It seems more likely that the difference is not in the nature of the vascular disease but rather in its speed of development, and the one clinical type therefore merges gradually with the other. In its most rapid form the kidneys are quickly overwhelmed and death is from uraemia, but if the tempo is slower the kidneys survive and time allows other forms of disaster to overtake the patient. However, the most convincing evidence in favour of a single disease process comes from experience of sympathectomy for hypertension, for there is no doubt that even the malignant form of the disease can on occasion be arrested by sympathectomy.

One result of this five-year study is to suggest that, given the opportunity of examining hypertensive patients before they reach the age of 50, it ought to be possible to identify not only the malignant type of case but also this other type which, while not rapidly fatal, is nevertheless unlikely to survive, at least without incapacity, much beyond the age of 60. The commonest interrupting factor in the less rapid though unfavourable case is of course a cerebral vascular accident, and by the age of 60, or scarcely beyond, about one-fifth of the patients in this study had experienced some type of stroke. Others developed premature congestive failure either as a consequence of coronary thrombosis or independently of this. The three deaths from uraemia at a relatively late stage were in each case associated with cardiac failure.

While, of course, we are here on less familiar ground, there seems to be some chance of foreseeing the possibility of these disasters. In the first place, as a generalization it seems certain that, regardless of all other features of his case, a male of average build with diastolic blood pressure of the order of 130 mm. Hg or above has an unpleasantly slender chance of surviving unscathed to the age of 60. Coronary thrombosis can scarcely be foreseen, except that

the risk of this is obviously greater in a patient already anginal, but the premature development of congestive failure may perhaps be anticipated if the heart has early become enlarged or, on the other hand, if the strain pattern has appeared in the electrocardiogram before enlargement of the heart is obvious (Leishman, 1951).

The fate of a hypertensive patient seems to be largely determined by vascular changes which are still imperfectly understood. Oedema of the optic nerve, exudation and haemorrhage into the retina, and leakage of albumin into the urine are recognized as sinister developments; all of these suggest loss of vascular integrity, yet experience of sympathectomy has shown that these changes are reversible. It is not unreasonable, therefore, to assume the development of a biochemical lesion, possibly from anoxia, or perhaps owing to some other metabolic poison. The observations here reported have suggested that the speed with which these vascular changes develop is principally governed by the height of the diastolic pressure. The critical level, indeed, appears to be in the neighbourhood of 130 mm. Hg (as recorded in an average-sized arm), and with pressures at or above this figure the process is likely to accelerate.

While the particular liability of hypertensive patients to cerebral vascular accidents is presumably a further expression of this vascular vulnerability, it is not of course suggested that a stroke is likely to occur only when the retina shows advanced changes and the urine contains much albumin. Examination of the patients who subsequently suffered cerebral vascular accidents at a premature age has, however, generally indicated that all systems were reacting unfavourably. The impression has often been gained that changes which in a benign case might take 10 to 15 years to develop have here appeared in half that time, and for this reason the designation "accelerated" hypertension seems appropriate for this form of the disease.

Conclusions

The character or severity of a hypertensive patient's symptoms, other of course than those which point to cardiac or renal failure, give little clue to his subsequent fate. Headache, for example, has occurred as often in mild as in severe cases. Again, it might well have been expected that the transient cerebral attack ascribed to "angiospasm" would prove to be a curtain-raiser for the subsequent full-length drama of a stroke; but this has not been the case, and the incidence of such cerebral episodes was no higher among patients who subsequently had strokes than in those who did not. Since in addition neither a family history of hypertension nor the existence of a renal basis for the hypertension appears to influence prognosis unduly, assessment of a hypertensive patient must rest fundamentally upon objective findings.

Early recognition of the accelerated form of hypertensive disease is particularly desirable, since it is in this type of case that sympathectomy has most to offer, and operation performed in time may completely transform its character. Appropriate cases, however, will not be selected for sympathectomy unless the practice is adopted of submitting every hypertensive patient under the age of 50 to a systematic assessment with the object of establishing how far the disease has already progressed, for only by relating this to the age of the patient can it be decided whether or not the speed of advance has been excessive.

Summary

The selection of appropriate hypertensive cases for lumbodorsal sympathectomy presents difficulties which can be resolved only by a wider knowledge of prognosis in this disease.

In the hope of acquiring this knowledge 151 hypertensive patients below the age of 60 have been studied by regular examination over periods ranging from two-and-a-half to five years.

During the period of observation 51 patients died as a result of hypertension, giving a mortality rate of 34%. The mortality for men alone was 44%. The height of the diastolic blood pressure had an important influence on the mortality rate.

A familial tendency has not appeared to prejudice a hypertensive patient's prospects, and the existence of a primary cause for the hypertension had only a slight adverse influence.

It is probable that the combination of obesity with hypertension appears favourable only on account of the misleading sphygmomanometer reading.

The progress or fate of these patients has been related to the main clinical features which presented at their first examination.

It is suggested that the stage reached by the disease can best be judged on the presence or absence of four features—namely, advanced retinal changes, albuminuria in excess of a trace, cardiac enlargement, and abnormality of the electrocardiogram.

If the present stage of the disease is recognized the rate of its advance can be estimated, and thus to a large extent the prognosis may be foreshadowed.

Even at the first examination it should generally be possible to classify the type of hypertensive disease as "benign" or "accelerated."

Sympathectomy is principally justified in patients with the accelerated form of hypertensive disease.

REFERENCES

- Bechgaard, P. (1946). *Acta med. scand.*, Suppl. 172.
 Blackford, J. M., Bowers, J. M., and Baker, J. W. (1930). *J. Amer. med. Ass.*, 94, 328.
 Frant, R., and Groen, J. (1950). *Arch. intern. Med.*, 85, 727.
 Goldring, W., and Chasis, H. (1944). *Hypertension and Hypertensive Disease*, p. 26. Milford, London.
 Janeway, T. C. (1913). *Arch. intern. Med.*, 12, 755.
 Leishman, A. W. D. (1951). *Quart. J. Med.*, 20, 1.
 Platt, R., and Stanbury, S. W. (1950). *Lancet*, 1, 651.
 Wagener, H. P., and Keith, N. M. (1939). *Medicine*, 18, 317.
 Wood, P. (1950). *Diseases of the Heart and Circulation*, p. 436. Eyre and Speltiswoode, London.

PULMONARY EMPHYSEMA TREATED BY PNEUMOPERITONEUM

BY

R. D. C. BRACKENRIDGE, M.D., F.R.F.P.S.

Senior Medical Registrar, County Hospital, Whiston, Lancs

AND

A. THELWALL JONES, M.D., M.R.C.P., D.P.H.

Assistant Physician, United Liverpool Hospitals

Senior Consultant Physician, County Hospital, Whiston

Emphysema is a rather vague appellation given to patients suffering from dyspnoea, cough, and in some cases congestive cardiac failure. The term usually means the chronic hypertrophic vesicular emphysema with the "large lungs" described by Sir William Jenner.

A severe disability results from progressive dyspnoea, and all clinicians recognize the common clinical features of a life made wretched and too often hopeless. The breathless existence of the patient is prolonged to some extent by the control by antibiotics of episodes of acute pulmonary inflammation.

Emphysema occurs more commonly in men than in women, and this incidence seems pronounced enough to raise the suspicion of an occupational factor. There is no conclusive evidence on this point, but the inci-

dence does not seem to be higher in occupations where "blowing" is a feature. The effect of hard manual work is doubtful, but the importance of attacks of bronchitis and the effect of a chronic cough is recognized. Asthma is also recognized as an important predisposing factor, and bronchospasm in childhood may be followed by years of good health to be succeeded by the development of emphysema.

The essential pathological feature is a loss of elasticity in the lungs, which are voluminous but not truly distended. The lungs are pale, and the blood is supposedly pressed out of the capillaries. The alveolar walls are atrophied, bullae develop, and the intrapleural pressure is raised. Expiration is thus impaired, being largely a passive process produced by recoil of the elastic tissues of the lung. The changes result in an inability to ventilate the lungs, and the oxygen saturation of the arterial blood falls to 85%. The carbon dioxide in the blood and alveoli rises and the patient is unable to compensate by increasing the pulmonary ventilation. The inspired air tends to be drawn into avascular and dilated alveoli which form a large pathological dead space.

The clinical picture in the established case is one of misery. Dyspnoea is caused by the increased blood carbon dioxide and cyanosis is largely central. Polycythaemia is fairly common and clubbing of the fingers is sometimes present even in uncomplicated cases. The movement of the chest is poor and expansion often less than 1 in. (2.5 cm.); the antero-posterior diameter is widened and the shape sometimes "barrel"; the accessory muscles of respiration are fully employed; and hyperresonance obscures the hepatic and cardiac dullness. Air entry is poor, rhonchi and rales are widespread, and bronchospasm is often present.

Points in Diagnosis

Christie (1944) and others have stressed the importance of associated conditions. The diagnosis is not to be based on isolated symptoms and signs: it is established by the development of insidious dyspnoea on exertion which is not due to bronchospasm or left ventricular failure, together with some of the characteristic signs, and chronic bronchitis or asthma. The long duration and seasonal aggravation of the dyspnoea distinguishes it from cardiac dyspnoea, and there are no nocturnal attacks unless asthma is present. X-ray features are not diagnostic, but several abnormalities are common. Whitfield *et al.* (1951) found that the most constant radiological abnormalities were depression and flattening of the diaphragm, with poor respiratory excursion, the relative brilliance of the lung bases, and the translucency and area of the retrocardiac and antero-cardiac windows. The ribs are widely separated and transversely placed, and there is rotation and elongation of the heart shadow associated with prominent pulmonary arteries.

In many cases of emphysema associated with severe dyspnoea it is difficult to determine and assess the influence of myocardial failure. McMichael and Sharpey-Schafer (1944) showed that the cardiac output is normal or increased in cases of heart failure secondary to lung disease. Cardiac catheterization in cases of emphysema reveals that the right ventricular systolic pressures are normal but become raised with the development of cardiac failure. The pressure returns towards normal with recovery from failure, proving that the pulmonary hypertension cannot result solely from fixed anatomical changes in the vascular bed of the lungs (Mounsey *et al.*, 1952).

The clinical details of the cases under review are given later, but the electrocardiograms do not seem to help in diagnosing or in selecting cases. Seven cases had normal electrocardiograms, one case had cor pulmonale, and one had right axis deviation, and no difference was apparent